Time-resolved Far-IR Spectroscopy of Quasiparticle Recombination in $BaPb_{1-x}Bi_xO_3$ Films

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Oxide superconductors have shown evidence for unusual quasiparticle scattering processes and gap anisotropy, very much different from what is observed for metallic (low T_c) superconductors. Both gap anisotropy and scattering manifest themselves in the relaxation of excess quasiparticles. We have studied the generation and relaxation of excess quasiparticles in the oxide superconductor $BaPb_{1-x}Bi_xO_3$ (x~0.25) using time-resolved far-infrared spectroscopy. The samples were thin films, produced by pulsed laser deposition onto MgO substrates. Measurements were performed using the same pump-probe technique developed for the study of Pb and other low T_c superconductors. Both the excess quasiparticle signal magnitude and relaxation time were measured as a function of temperature. While the excess quasiparticle signal shows a BCS-like behavior, the effective lifetime is found to be 1 ns and independent of temperature to below $T_c/2$. While the effective lifetime value is reasonable in magnitude, the lack of any temperature dependence is unexpected. Further studies at lower temperature are planned.

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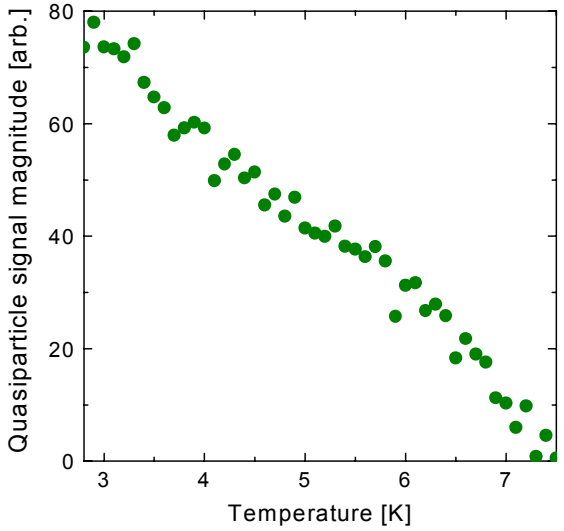

Figure 1. Excess quasiparticle signal as a function of temperature.

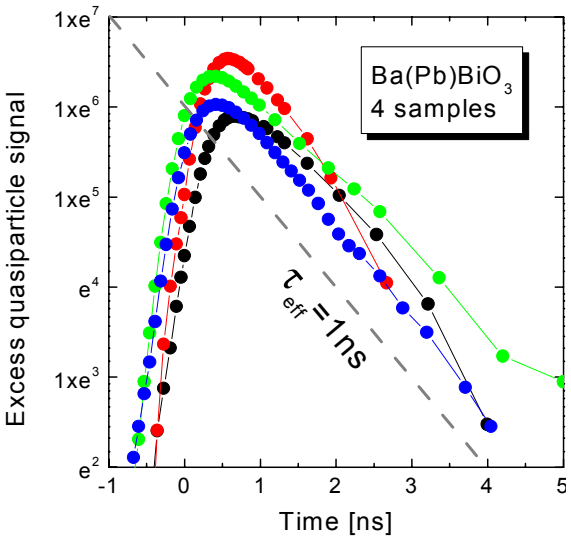

Figure 2. Effective lifetime for 4 different Ba(Pb)BiO3 films. A 1 ns lifetime is found for all temperatures down to below 3K.